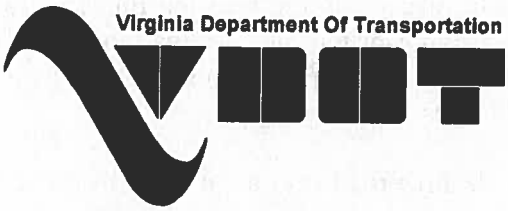
Loudoun County Southern Subarea Analysis

Prepared for
Loudoun County Planning Commission

Prepared by
Northern Virginia Transportation Planning
Virginia Department of Transportation



March 2010

Loudoun County Southern Subarea Analysis

Upon Loudoun County's Planning Commission (PC) request, Northern Virginia Transportation Planning Section (TP) at VDOT agreed to conduct an analysis of the area south of Dulles Airport/ US 50 between Loudoun/Fairfax Counties line and VA 659 (south Dulles Area). The request for this technical assistance was made following VDOT's review and comments on the County's Comprehensive Plan update which included the County PC's recommended roadway scenario with lane reductions on three roadways within the South Dulles Area. The agreed-upon analysis consisted of using Loudoun County's travel demand model to identify local and non-local trips that use these roadways.

In order to address the request, VDOT-TP performed Select Links Analysis using Loudoun County's 2030 model output for both current Countywide Transportation Plan (CTP) and Planning Commission's proposed network (PC) for 3 road segments:

- Tall Cedars Parkway east of Loudoun County Parkway,
- VA 606 Extension (Gum Spring Road) south of Tall Cedars Parkway,
- VA 659 Relocated (North Star Boulevard) south of Braddock road.

Three road segments were selected for analysis since for each roadway, the PC's modeled network proposed lane capacity reduction from 6 to 4 lanes.

The purpose of this analysis was to identify local and non-local trips during PM Peak Period. PM Peak Period is identified as the most congested period according to Loudoun County and other regional models (MWCOG) thus the select links analysis was performed for this period. In addition, the effects of the proposed capacity reductions were reviewed.

Select link analysis used here is based on NCHRP 255, Highway Traffic Data for Urbanized Area Project Planning and Design. This exercise was to identify the origins and destinations of the trips and paths of travelers on these roadway segments, as projected by Loudoun County 2030 Model. The product consists of two sets of data: select link assignment and select link trip table. Select link assignment assists in identifying directions and path of trips on the selected link (roadway segment). Select link trip table assists in identifying origin and destination of trips traveling along the selected link (roadway segment). The trip table also helps identify network errors by showing illogical paths, and/or possible diversions.

The resulting trip tables for all three roadways are a 1287 by 1287 matrix tabulating trip exchanges. These trip tables were "squeezed" (combined) into a 54 by 54 matrix of districts. The area considered "local" in this analysis is denoted in Figure 1. Size of local zones within the study area remained unchanged. However zones far from the "local area" were grouped together into larger "districts" (figure 2). A map of the region depicting the districts in the matrix is shown in figure 2. Table 1 shows the Loudoun County Model zone equivalency of 1278 zones to 54 districts. The zones within the "local" are represented by districts 27 through 40 (highlighted in yellow shade). The rest of Loudoun County zones were combined into districts based on their corridor accesses. Zones for City of Alexandria, Arlington, DC, Prince Georges', eastern Fairfax, and eastern Montgomery counties were combined as one district number 55. The outer counties such as Fauquier and Stafford are represented by one district each.

Loudoun County Southern Subarea Map

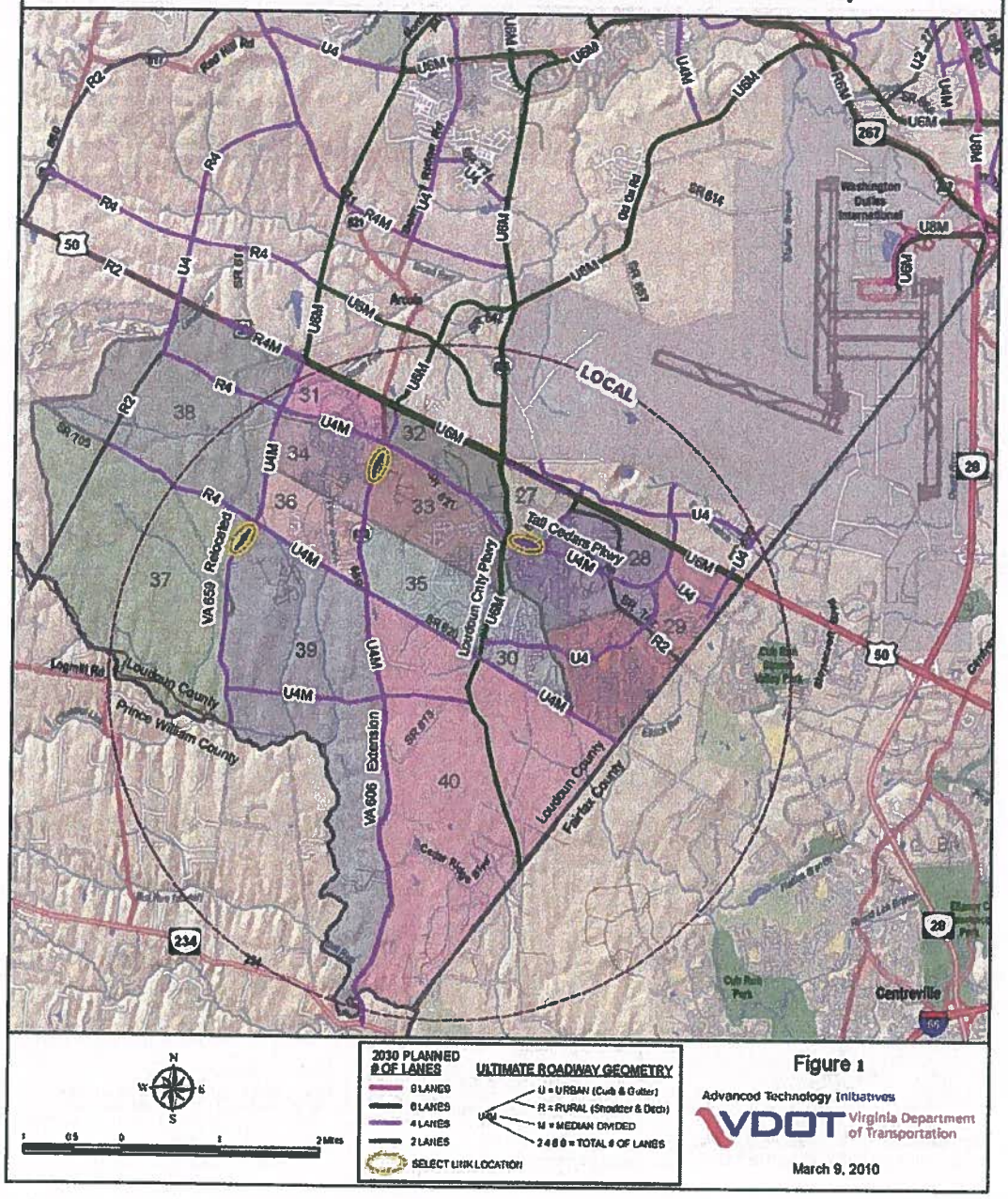


Figure 1

Advanced Technology Initiatives

VDOT Virginia Department of Transportation

March 9, 2010

Loudoun County Regional Zone Map

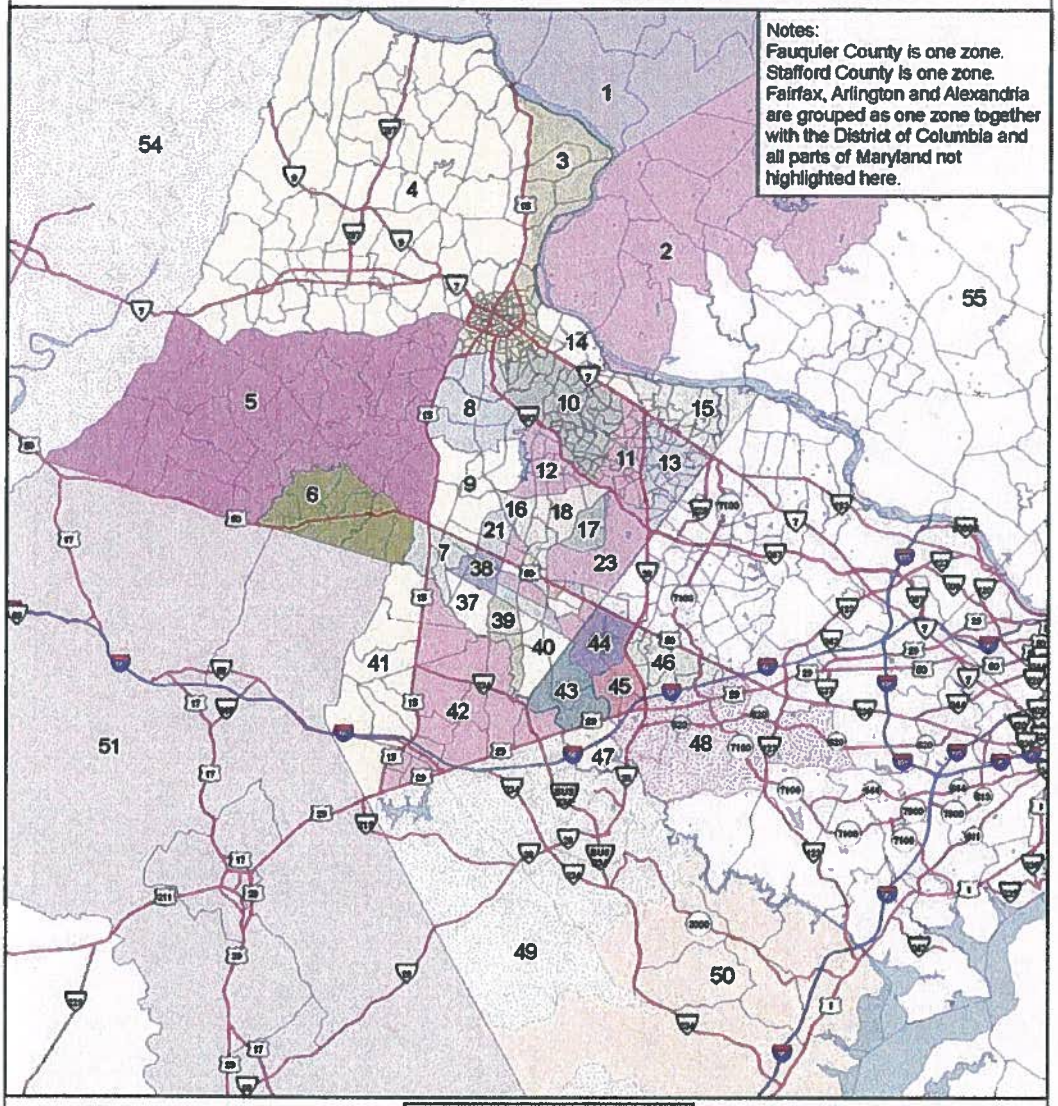


TABLE 1
Zone to District Equivalency

District	Loudoun County Zone					District	Loudoun County Zone				
1	634-640	933-936	938-942	945		30	85				
2	617-619	622-626	628-633	866	874-875	31	75				
3	171-172	225-229	401-533			32	96				
4	163-170	188-224	230-276			33	95				
5	149-153	160-162	342-361			34	76				
6	154	156	158	362-369		35	94				
7	128-130	135-136	155			36	77				
8	97-99	138-139	183-187			37	134	137			
9	100-101	140-142	144	146	157	38	131-133				
10	14	29-32	35	38-74	177-182	39	79-81				
11	1-13	15-28	33-34	36-37	277	40	78	82-84			
12	102	110	113-114	119-127		41	755-763				
13	159	278-315				42	743-744	764-773	776-783		
14	173-176	329-330	338-341			43	649-650				
15	316-328	331-337				44	687-689				
16	103-104					45	659-662				
17	117-118					46	663-665	670-672	677-678	690-693	
18	111-112	115-116				47	651	653			
19	106	108				48	652	654-658	673-676	1099	1108
20	105	109				49	745-754	774-775	1155-1157	1162-1165	
21	145	147				50	1149-1154	1159-1161			
22	143	148				51	784-785	1212-1218			
23	375					52	1184-1192	1198	1202-1204		
24	87					53	786-795				
25	90					54	601-616	620-621	627	641-648	666-669
26	89						679-686	694-742	801-835	841-862	864-865
27	88						867-869	881-924	943-944	946-950	956-964
28	91	93					970-976	982-998	1004-1009	1015-1020	1026-1039
29	86	92					1045-1060	1066-1071	1077-1098	1104-1107	1174-1178

The table below (Table 2) shows, for each of the segments analyzed the roadway's total trips, trips that have both origin and destination within the local area, trips that have either origin or destination within the local area, and trips that pass through the local area (non-local). Both Tall Cedars Parkway and VA 606 Extension show significant number of local trips while VA 659 Relocated is expected to carry more through trips. The PM Peak Period was selected for analysis.

TABLE 2
PM Peak Period Vehicle Trips - Both Directions
(Proposed Planning Commission's 2030 Network)

Roadway	Limits		Total trips	Trips with both O&D within the local area *		Trips with O or D within the local area (LOCAL TRIPS)		Non-Local (THROUGH TRIPS)	
Tall Cedars Parkway	S. Riding Rd.	Loudoun Co. Pkwy.	6,413	1,573	25%	4,403	69%	2,010	31%
VA 606 Extension	Tall Cedars Pkwy.	Braddock Rd.	9,601	1,703	18%	5,033	52%	4,568	48%
VA 659 Relocated	Braddock Rd.	Leenha Loop Rd.	11,550	633	5%	4,407	38%	7,143	62%

* Internal portion of local trips

A summary of the evaluation for each roadway is as follows:

TALL CEDARS PARKWAY-

County-Wide Transportation Plan (CTP) calls for a 6-lane divided section for this roadway by 2030. P.C.'s recommendation is for a lane reduction to 4-lane divided roadway. Select link analysis of County's model of P.C.'s recommended network was performed; the model output shows 6,413 vehicle trips travel through Tall Cedars Parkway just to the east of Loudoun County Parkway intersection during PM Peak Period in both directions. Almost 70% (4,403) of the total trips (6,413) on this segment of Tall Cedars Parkway have either destinations, or origins (or both) within the local area (considered "local" trips). About 25% of trips (1,573) have both the origin and the destination in the immediate area encompassed by Fairfax County Line, US 50, US 15, and Prince William County Line also labeled as local area for this analysis, (see figure 2).

A review of volume to capacity ratios from CTP & PC model outputs suggests that performance of this roadway would not deteriorate with the lane reduction (V/C of about 0.9 would not change significantly), due possibly to some traffic diversion to parallel roadways.

VA 606 Extension (Gum Spring Road) –

CTP calls for a 6-lane divided section for this roadway by 2030 and P.C.'s recommendation is for a 4-lane divided roadway. Select links analysis of County's model of P.C.'s recommended network was performed; the model output shows 9,601 trips on VA 606 Extension directly south of Tall Cedars Parkway intersection during Peak Period in both directions. About 52% (5,033) of the total trips on this segment of VA 606 Extension have either destination or origin (or both) within the local area. Among these local trips almost 18% (1,703) of total trips have both the origins and destinations within the local area.

Please note that the impact of the capacity reduction from 6 to 4 lanes is reflected in the model's output by a substantial worsening of roadway performance (from very congested V/C of 2.6 to extremely congested level of 3.70). This lane reduction, compounded with a similar lane reduction being proposed along VA 659 relocated, cause diversion to Loudoun County Parkway. Despite the diversion, this low capacity proposed for VA 606 Extension exacerbates the already serious congestion. Related roadway network performance is presented in Table 3 below.

VA 659 Relocated (North Star Boulevard) –

CTP calls for a 6-lane divided section for this roadway by 2030 and P.C.'s recommendation is for a 4-lane divided roadway. Select links analysis of County's model of P.C.'s recommended network was performed; the model output shows 11,550 trips directly south of Braddock Road intersection during Peak Period in both directions of VA 659 Relocated. About 62% (7,143) of the total trips on this segment of the roadway have both origin and destination beyond the local area (considered through trips). The remaining 38% of the trips have either origin or destination in the local area. The number of trips that have both the origins and destinations within the local area is 633 trips, a very low portion of the total trips (less than 5%).

The analysis above also indicates that the majority of the trips on VA 606 Extension and Tall Cedars Parkway are local (at least one end of the trip is within the local area defined above) yet serving different areas. VA 659 relocated however serves more of the areas outside the local area, such as Prince William and Fauquier Counties.

To further review the effects of the proposed capacity reductions on the roadway performance the table below (Table 3) presents 2030 model output for road segments affected under both current CTP and proposed PC plans.

TABLE 3
Comparative Summary of Loudoun County Model's 2030 Output
Selected Roadways

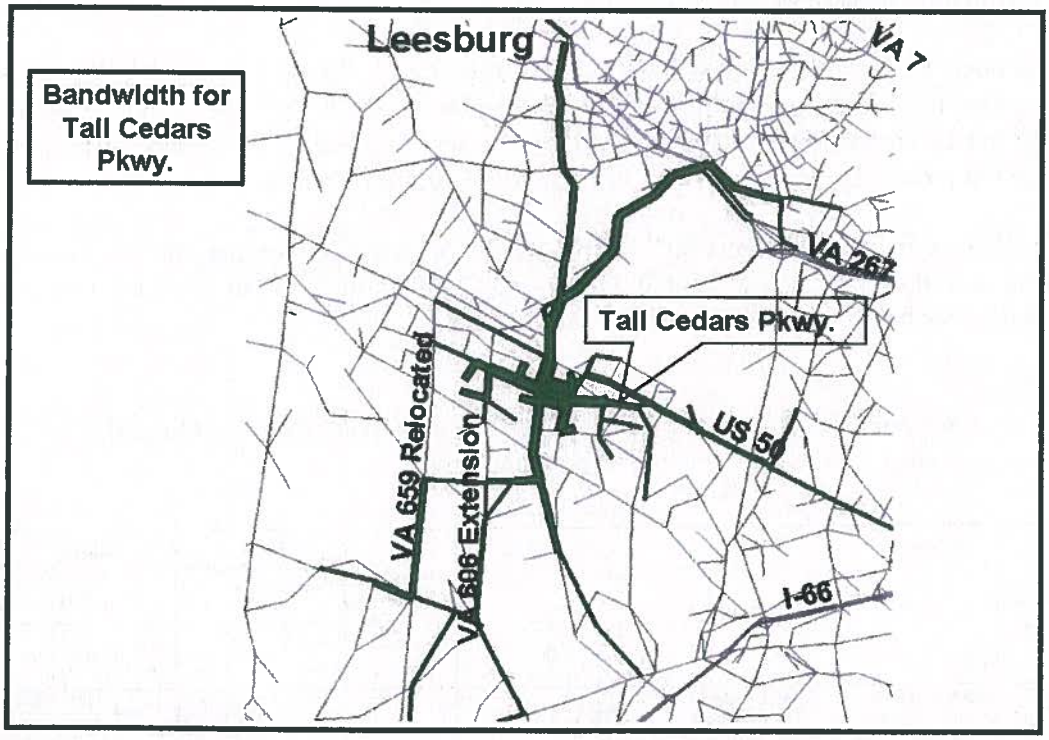
Route #	Name	Limits		Existing # of Lanes (MWCOG 2009)	Current Countywide Transp. Plan (CTP)			Planning Commission's Network (PC)		
		From	To		# of Lanes	ADT	V/C	# of Lanes	ADT	V/C
606	Gum Spring Road	Tall Cedars Pkwy.	US 50	N/A	6	77383	2.58	4	74009	3.7
659	North Star Blvd.	Braddock Rd.	PW Co. Line	2	6	50535	1.85	4	31809	0.99
607	Loudoun County Parkway	Tall Cedars Pkwy.	US 50	N/A	6	63731	1.34	6	95707	2.25
Level-of-Service (LOS) and V/C ranges:										
LOS	A, B, C	D	E	F	>>F					
V/C	0 - 0.6299	0.63 - 0.78999	0.79 - 0.9999	>=1.0	>2.0					

As can be seen, the combined lane reductions to 4 lanes proposed for both VA 659 Relocated and VA 606 Extension cause a significant traffic volume diversion to proposed Loudoun County Parkway. This diversion would nearly double V/C ratio from 1.34 (congested conditions) to 2.25 (very severely congested conditions). The above analysis does not support the combined lane reductions for VA 659 Relocated and VA 606 Extension for the South Dulles area.

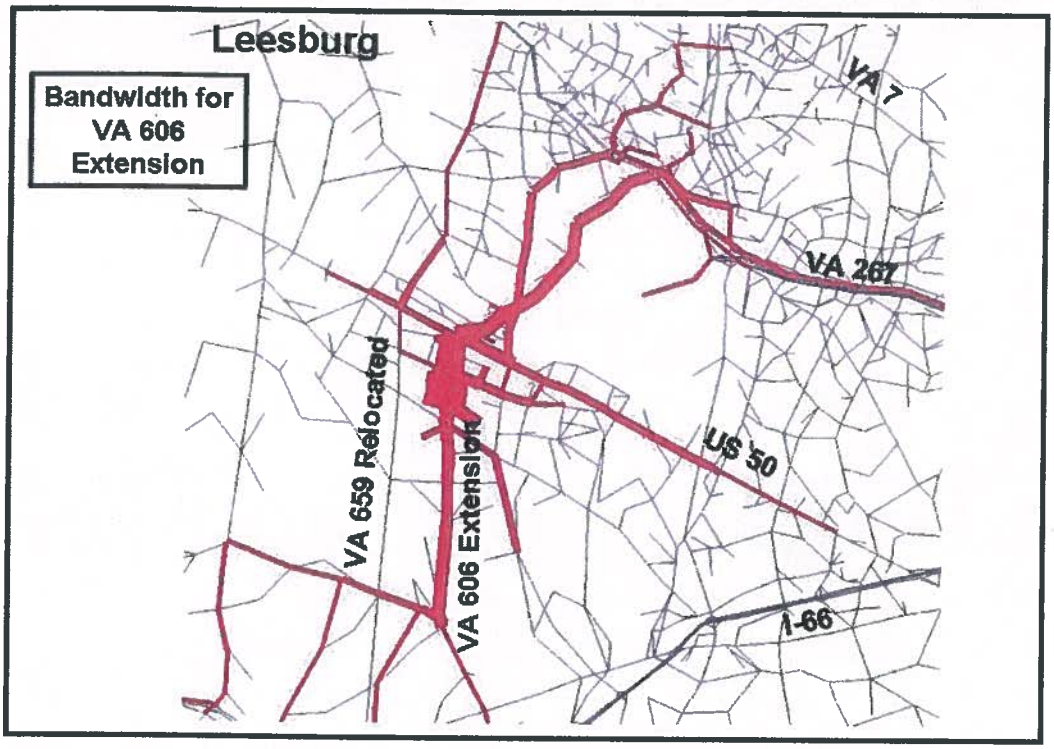
The following figures depict the bandwidth of the trips on these three roadways showing the overall view of trips origins/destinations in addition to directions. Bandwidth is a graphical representation of the number of trips passing through a link – a wider bandwidth represents a larger volume of trips. Trips on Tall Cedars Pkwy. and VA 606 Extension appear to be more of east-west directions as opposed to VA 659 relocated which appears to be north-south direction. Trips using VA 659 relocated are shown to travel the farthest in northerly and southerly directions, as opposed to trips on VA 606 Extension and Tall Cedars Parkway that serve trips to/from east.

The trip bandwidth for this area also provides a level of confidence in the model output for this area of the County as the output did not show substantial number of trips making illogical path selection. As stated, both the trip bandwidths and the proportion of non-local to local trips, show 2030 trip assignments of the model which are logical for the roads examined. The assignments also appear consistent when considering network connections within and outside the County lines (VA 659 Relocated has higher proportion of non-local to local trips than does VA 606 Extension).

Loudoun County 2030 Select Link Bandwidth



Loudoun County 2030 Select Link Bandwidth



Loudoun County 2030 Select Link Bandwidth